

Abstract

An optical repeater is provided that includes at least four optical amplifiers each supplying optical amplification to an optical signal traveling in a different unidirectional optical fiber that collectively form at least two bi-directional pairs of optical fibers. The repeater also includes a first plurality of pump sources for providing pump energy to a first optical fiber located in a first of the optical fiber pairs and a second optical fiber located in a second of the optical fiber pairs. The first optical fiber and the second optical fiber support optical signals traveling in a common direction. A first combiner arrangement combines the pump energy from the first plurality of pump sources and distributes it to the optical amplifiers supplying amplification to optical signals traveling in the first and the second optical fibers. A second plurality of pump sources provides pump energy to a third optical fiber located in the first optical fiber pair and a fourth optical fiber located in the second optical fiber pair. The third optical fiber and the fourth optical fiber support optical signals traveling in a common direction that is opposite to that of the first and second optical fibers. A second combiner arrangement combines the pump energy from the second plurality of pump sources and distributes it to the optical amplifiers supplying amplification to optical signals traveling in the third and the fourth optical fibers.